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Importance of MDCT for evaluating proximal tibia fractures

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Abstract

Proximal tibia fractures are most challenging fractures treated by surgeons, usually caused mainly due to high velocity trauma as motor vehicle accidents, sports injuries, due to varus or valgus load with or without axial loading or high energy trauma. Early diagnosis and better visualisation through recent radiological modalities can result in good prognosis in form of anatomical reduction and osteosynthesis and preventing impending compartment syndrome and later joint stiffness, early mobilisation and finally good outcomes in form of patient and surgeon satisfaction. Initial diagnosis is usually made with plain skiagram in both anteroposterior and lateral views. NCCT knee with 3d reconstruction are newer modalities which help surgeon in planning for maintainance of articular surface and bone fragments than plain skiagrams. **Material and Methods:** 30 patients were included in the study with isolated proximal tibia fractures. MDCT with plain skiagram was performed for deciding management as per Schatzker classification and were planned and managed accordingly. **Results:** Out of thirty patients, majority of the patient classified as schatzker type 2. The patients were managed accordingly as per fracture pattern. **Conclusion :** The importance of MDCT for proximal tibia fracture is very crucial in diagnosing as per classification and for better planning.

Keywords: MDCT; Proximal fractures; Tibia

1 INTRODUCTION

Complex fractures of the tibial plateau commonly occur in patients following high-energy trauma, typically accompanied by severe damage to the knee articulation and the surrounding tissues. The diagnosis and treatment of complex tib-

ial plateau fractures remains a significant challenge in orthopaedic trauma.^(1,2)

Earlier investigation related to fracture were limited to x ray, but as per now modalities have changed, now proximal tibia fractures are better classified on MDCT findings and extent of fracture and treatment options are better decided

on it.

The treatment for these fracture aims to achieve anatomical reduction of the joint surface and stable osteosynthesis in order to enable early mobilization, so as to prevent complications such as joint stiffness and post-traumatic arthrosis.⁽³⁾

The tibial plateau can be anatomically classified into the following 4 quadrants on an axial CT image at the subchondral level, as previously proposed by Luo et al.⁽⁴⁾ antero-lateral, posterolateral, anteromedial, and posteromedial (Figure 1).

Figure 1 Axial computed tomography scan at the subchondral level showing a posterolateral (PL) articular fragment. Point O is the center of the knee (midpoint of 2 tibial spines), point A is the anterior tibial tuberosity, point B is the posterior sulcus of the tibial plateau, point C is the most anterior point of the fibular head (F), and point D is the posteromedial (PM) ridge of the proximal tibia. Although a fracture line exists in the posteromedial quadrant (black arrow), the posteromedial cortex remains intact and a posteromedial fracture was excluded.

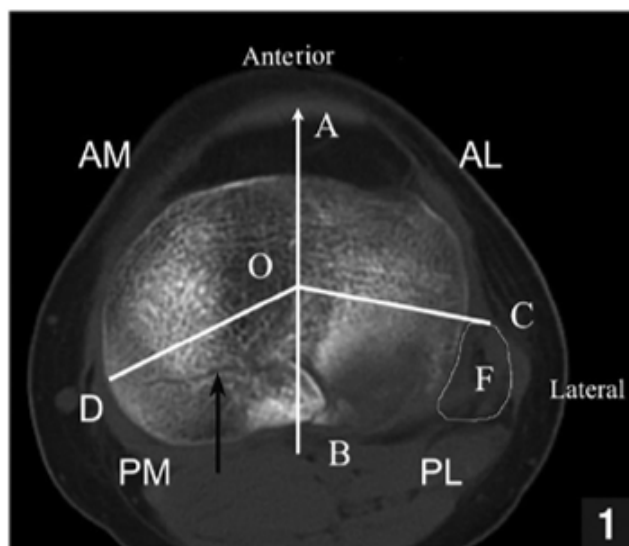


Fig 1.

Abbreviations: AL, antero-lateral; AM, anteromedial.⁽⁵⁾

2 MATERIALS AND METHODS

The study included 30 consecutive patients admitted with tibial plateau fractures. Patients were investigated initially with plain skiagram and later MDCT was done and classified accordingly as per schatzker classification and as per fracture pattern patients were planned accordingly for surgery. Isolated proximal tibia fracture were included in the study.

Schatzker classification of Tibial Plateau Fracture

Type 1 – a vertical split of the lateral condyle.

Type 2 – a vertical split of the lateral condyle combined with depression of an adjacent loadbearing part of the condyle.

Type 3 – depression of the articular surface with an intact condylar rim.

Type 4 – fracture of the medial tibial condyle.

Type 5 – fracture of both condyles.

Type 6 – combined condylar and subcondylar fractures.



3 RESULT

Thirty patients with proximal tibial plateau were included in the study, ranging between 20 and 60 years. They were 21 males (70%) and 9 females (30%) and all patients were subjected to plain skiagram and MDCT and were classified as per schatzker classification.

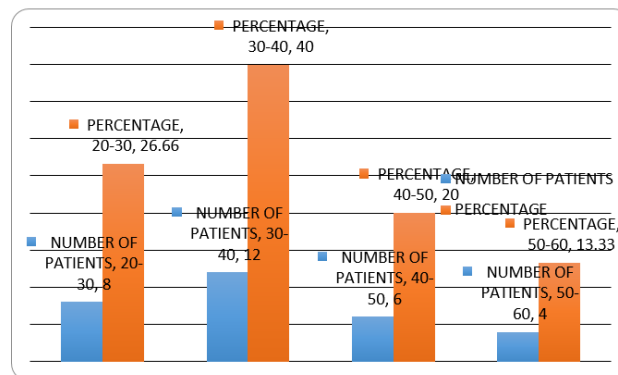


Table 1. SCHATZKAR classification

SCHATZKAR Classification	Plain skiagram	MDCT
Type 1	2	1
Type 2	17	19
Type 3	5	3
Type 4	3	5
Type 5	2	1
Type 6	1	1

Above table showing distribution of patient as per classification on plain skiagram and MDCT (Table 1)

In table 1 most of the fractures were type 2, as per schatzkar classification and was seen in majority of the cases. Above mentioned table shows that most fractures on plain skiagram were

underestimated and were actually re-classified after MDCT 3d reconstruction and surgery was planned accordingly. In type 4-6 there was excessive swelling, therefore initially managed with calcaneum skeletal traction or knee spanning external fixator (planned as per patient swelling, blister formation and risk of compartment syndrome) and when there was subsequent decrease in swelling, patient was operated accordingly as per fracture. Various modalities were planned as double incision and bilateral plates, single plate, bilateral plates via genicular anterior midline incision and use of bone graft as per fracture necessity and later post-op rehabilitation protocol was followed.

4 DISCUSSION

Proximal tibia fracture needs extra attention in order to prevent post-traumatic stiffness, need of maintaining articular surface to avoid varus and valgus angulation and most orthopaedicians use CT to classify fracture and assess the depression of the tibia and the degree of diastasis (splitting) of the fractured parts to plan for surgical intervention.^(6,7)

Brunner et al.⁽⁸⁾ found that CT scanning improved the inter observer and intra observer reliability of the Schatzker, OTA/AO, and Hohl classification systems for tibial plateau fractures. Various classification are used for proximal tibia fracture as Arbeitsgemeinschaft für Osteosynthesefragen (AO), Three column by Luo et al.⁽⁹⁾, and Schatzker (widely used).

With the great achievement in maintaining good articular surface and excellent post-surgical results by avoiding complications provides surgeon as well as patient satisfaction.

In current study after MDCT plan of surgical treatment was modified in 8 cases (26.66%) which helped surgeon in planning surgery and thus MDCT helped in managing patient more accurately but skiagram itself is important investigation in emergency department to predict the outcome of fracture and managing complication and deciding plan of further management.

In our study most acceptable classification used was schatzkar but three column classification helped in managing posterior column fracture more accurately.

A knee fracture can be potentially harmful and cause complications if not detected and accurately managed.^(10,11) Tibial plateau fractures are common injuries that can lead to major disability.^(12–14) They usually result from indirect forces, and occasionally from a direct blow.^(13,14) Only 5–10% of tibial plateau fractures are confined to the medial plateau; another 10–15% involve both plateaus; the remaining 75–80% are limited to the lateral plateau.^(13–15)

Even in the lateral view it is difficult to appreciate the posterior portion of the tibial plateaus.^(13,15,16) This can be improved by obtaining the view (tibial plateau view), in which central beam is tangential to the tibial plateaus. This provides a better view of the tibial plateaus and the amount of depres-

sion is visualized more accurately,^(15,16) but appropriate positioning can be difficult and time-consuming in the case of severely injured patients.

MDCT provides us better view to decide fracture outcomes. MDCT detected more loose fragments and also the site of origin was detected with high sensitivity. Ligamentous injuries occur in 10–12% of plateau fractures, and it is also known that in adult, the ligament will more commonly rupture in its midportion than at its sites of attachment.⁽¹⁵⁾

5 CONCLUSION

Primary modality in acute injuries can be evaluated easily by skaigram but complex trauma always requires higher imaging modalities like MDCT and should be recommended for deciding better prognosis and surgical plan for surgeon as well as patient satisfaction in form of good outcomes post-operatively.

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